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ABSTRACT

A study compared the perceptions of electronic technology education teachers and employers in the electronics industry regarding the competencies graduates need for employment in the industry. The study population consisted of 27 state institutions with electronics technology programs in Arkansas, Missouri, Kansas, Oklahoma, Illinois, Kentucky, and Tennessee and 60 employers that were listed as anticipating a need to hire electronics technologists and having hired graduates from one of the study schools within the past 5 years. Twenty-one institutions (78 percent) and 45 employers (75 percent) returned survey instruments containing usable information. The educators placed more emphasis on topics that lend themselves to classroom instruction and tended to place less emphasis on the operations involved in complex circuit operation than did the employers. Specifically, the teachers emphasized such terms as calculate, describe, solve, and verify, whereas employers placed most emphasis on such terms as construct, connect, and set up and test. Teachers and employers were in close agreement concerning competencies dealing with principles of direct and alternating current. Employers tended to ascribe greater importance to skills in the area of microcomputers, industrial power, and the principles of industrial electronics than did the teachers. No significant differences were found between the employer and teacher attitudes toward competencies covered in courses in advanced electronic circuits, electronic drafting, radio communication, and electronic projects. (Included in this report is an eight-page table detailing teacher and employer rankings of the 104 competencies assessed.) (MN)

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THE EXTENT TO WHICH ELECTRONIC
TECHNOLOGY EDUCATION IS MEETING EMPLOYMENT NEEDS OF INDUSTRY

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**A STUDY TO DETERMINE THE EXTENT TO WHICH ELECTRONIC TECHNOLOGY
EDUCATION IS MEETING EMPLOYMENT NEEDS OF INDUSTRY**

One of the goals of education is to prepare individuals to live and work in the future. This future will be influenced by the society and culture in which these persons find themselves. "The purpose of school in any society is to acquaint individuals with the nature of their culture," (Olson, 1963, p. vii)

Times have changed since the introduction of the silicon chip in 1972. Electronics is a rapidly growing technology. Microstructure, Science, Engineering, and Technology (1979), prepared by a committee of the National Academy of Sciences, stated that the "modern era of electronics has ushered in a second industrial revolution -- its impact could be greater than that of the original industrial revolution." (p. 43) During the next decade or so, much of the growth in electronics will come as the technologies of computers and communications are joined. This combination will lead to the development of many new systems, new businesses, and new opportunities in electronics.

Transition from school to work appears to be a problem that requires immediate solution. According to Venn (1970), there is little room in the labor market for uneducated, unskilled workers. Instead of initiation, they find rejection. He further states that ". . .the technological work world is one of specialization and sophisticated skills." (p. 5)

The most obvious impact of high technology on T & I education will be to develop new programs required to prepare people for high technology occupations that previously did not exist. An examination of professional literature revealed a prevalent opinion that a gap exists between what is being taught in electronic technology education and what is needed by employers in the electronic industry.

PURPOSE OF THE STUDY

The purpose of the study was to determine if differences in perception existed between electronic technology education teachers and employers in the electronic industry regarding competencies needed by graduates for employment. Specific research questions proposed for the study were:

1. What competencies do educators perceive to be most important to training electronic technologists?
2. What competencies do employers perceive to be most important to training electronic technologists?
3. What significant differences in perception existed between educators and employers regarding important competencies.

POPULATION DESCRIPTION AND SAMPLE SELECTION CRITERIA

The study consisted of 27 state institutions in Arkansas, Missouri, Kansas, Oklahoma, Illinois, Kentucky and Tennessee which offer electronic programs and were not accredited by the Accreditation Board of Engineering and Technology (ABET), formerly known as the Engineers' Council for Professional Development (ECPD). The

Accreditation Board of Engineering and Technology provided a listing of accredited four-year electronic programs. Accredited programs were not included in the study.

Electronic industry representatives were selected from the College Placement Annual (1985), which lists personnel needs anticipated by more than 1200 corporate and government employers who normally recruit college graduates. The College Placement Annual (1985) listed 160 electronic industries in Arkansas, Missouri, Kansas, Oklahoma, Illinois, Kentucky and Tennessee.

To enhance the selection process, a letter requesting a list of electronic industries, that have employed program graduates in the last five years, was mailed to electronics program leaders. The response rate was 93 percent. A list of electronic industries was compiled from the data provided. The list was compared to the College Placement Annual (1985) listing. Sixty industries appeared on both lists. They were used in this study.

IDENTIFICATION AND VALIDATION OF COMPETENCIES

Numerous individuals and groups have identified competencies essential to work in electronics. Five competency lists were selected for review because each had been used in previous studies to identify competencies needed by electronic technologists in industry.

Synthesis of the five competency list yielded 120 competencies. To avoid unnecessary repetition, many similar statements from

the parent lists were combined. In addition, certain related and sequential tasks were compounded, to yield single, distinct competency statements rather than sequences of interrelated tasks.

Several competency development and validation methods were reported in the literature. Canfield (1972) suggested use of "expert opinions," which he defined as a process of discussion and interviews with knowledgeable individuals in a technical field. Such experts should be asked to specify the kinds of skills, attitudes, and knowledge required to perform "competently" in a given area. Therefore, a panel of experts was selected to evaluate the preliminary competency list.

Several criteria were used to select panel members:

1. That a majority of the members were teaching electronic technology in programs at four-year institutions or two year institutions.
2. That panel members were acknowledged as experts in the electronic field by their peers, administrators, and/or state office of education personnel.
3. That a least one panel member was a program director from an institution offering electronic technology programs.

The panel was assembled to review the 120 competencies on the preliminary list. The reviewed each competency statement to insure that it measured skills, attitudes and knowledge needed

to train electronic technologists for industry. After much deliberation, 16 competencies dealing with management and supervision were deleted from the preliminary list. The panel members reached consensus on the 104 competencies which were used in this study.

The next task assigned to the panel was to categorize the 104 competencies according to course content, i.e., in which course should be competency be taught. Consensus among the panel was easily reached in assigning the 104 competency statements to courses commonly taught in electronic technology programs.

DEVELOPMENT AND VALIDATION OF QUESTIONNAIRE

Likert (1932) used an attitude scale on which respondents could indicate personal agreement or disagreement while weighing the response by marking a point on the scale. A Likert format questionnaire was chosen as the instrument for this study.

The survey instrument was constructed by listing the 104 competency statements under 10 electronic course headings. The 10 electronic courses were selected from university catalogues. These courses were common to all ITET programs under study. Each competency statement was followed by a response section intended to measure importance as determined by electronic teachers and employers of electronic technology students.

DATA COLLECTION

Survey questionnaires were sent to 27 state institutions in Arkansas, Missouri, Kansas, Oklahoma, Illinois, Kentucky and

Tennessee which offer ITET programs. Twenty-one institutions (78 percent) returned the instrument with useable information. All institutions in Kansas, Kentucky and Oklahoma responded.

Survey questionnaires were sent to 60 employers of graduates of electronic programs. The questionnaires were sent to electronic industries in Arkansas, Missouri, Kansas, Oklahoma, Illinois, Kentucky and Tennessee. Forty-five (75 percent) returned instruments with usable information.

PREPARATION OF DATA FOR ANALYSIS

Data were summarized and presented in tabular form. Data were analyzed using standard SPSS (Nie, Bent, Hull, et al., 1970) programs and existing facilities at Southeast Missouri State University, Cape Girardeau, Missouri.

The computer was programmed for a t-test for independent means. The t-test for independent means is a commonly used test of significance. The t-test determines differences between groups on a specific characteristic. Any computed t-ratio (1.96) or higher on any competency statement is significant at the .05 level.

TREATMENT OF DATA

A review of literature indicated several studies utilized the Likert survey format to determine new values for competency statements. Mean response values were calculated for each of the 104 competency statements.

A measure of dispersion was calculated to indicate a relative agreement or disagreement between groups to each of the 104 competency statements. A standard deviation was calculated to complement each mean value.

Means and standard deviations for each competency statement are presented in Table 1. Data from educators yielded nine mean values greater than 4.00. Data from employers yielded only two mean values greater than 4.00.

Data from educators yielded eighty-nine mean values greater than 3.00. Data from employers yielded 100 mean values greater than 3.00.

Data from educators yielded six mean values greater than 2.00. Data from employers yielded two mean values greater than 2.00.

Six competency statements were rated very differently by educators and employers: define electrical quantities such as potential, current, resistance, power and energy (statement 2), solve problems involving three phase systems (statement 25), identify the characteristics of semi-conductors and properties of PN junctions (statement 26), graph curves of variables reluctance phase shift circuits (statement 45), write, debug and run microcomputer programs (statement 57), and test and performance of different types of DC motors.

TABLE I

DIFFERENCE OF RESPONSES BETWEEN EDUCATORS AND EMPLOYERS OF
THE IMPORTANCE OF COMPETENCIES AS SHOWN BY A T-TEST FOR INDEPENDENT MEANS

Competencies	EDUCATORS		EMPLOYERS		Value of t	Probability of t
	Mean	Standard Deviation	Mean	Standard Deviation		
<u>Principles of Applied Direct Current</u>						
1. Identify components by conventional methods such as symbols, specification, pictures, color, codes, etc.	4.24	0.944	4.22	0.902	0.065	0.9489
2. Define electrical quantities such as potential, current, resistance, power and energy.	4.48	0.750	3.93	1.095	2.349 *	0.0225
3. Calculate and verify unknown voltage, current, resistance or power in a simple circuit using Ohm's law.	4.24	1.091	3.71	1.141	1.801	0.0792
4. Verify series and parallel circuit operation using Kirchoff's law.	4.00	1.000	3.69	1.062	1.154	0.2552
5. Calculate and verify series-parallel circuits using network theorems.	3.48	0.981	3.64	1.004	- 0.644	0.5231
6. Identify the effects of capacitance and inductance in direct current.	3.91	0.944	3.80	0.991	0.413	0.6815
7. Apply voltage divider rule and current divider rule to circuit analysis.	3.71	0.902	3.73	0.889	- 0.080	0.9365
8. Describe the rpinciples of primary cells.	3.52	0.981	3.27	0.963	0.998	0.3247
9. Describe the properties of permanent magnetism and electromagnetism.	3.67	1.017	3.36	1.069	1.139	0.2613
10. Solve magnetic circuits to find required current and turns to build up a magnetic field strength, given permeability, dimension and type of cores.	2.90	1.091	3.29	1.036	-1.353	0.1841
11. Calculate single-time constant and select circuit components to obtain a specific time constant.	3.52	1.123	3.53	1.014	-0.033	0.9738

TABLE I CONTINUED

Competencies	EDUCATORS		EMPLOYEES		Value of t	Probability of t
	Mean	Standard Deviation	Mean	Standard Deviation		
12. Apply thevenins theorem, Norton's theorem, Delta-wye transformation and maximum power transfer theorem to DC circuit analysis.	2.86	1.352	3.31	1.184	-1.320	0.1955
13. Describe the temperature coefficient of resistance at temperature different from reference temperatures.	3.05	1.161	3.29	1.014	-0.818	0.4191
<u>Principles of Alternating Current</u>						
14. Identify and use the basic controls of an oscilloscope and set up and display various electrical waveforms.	4.00	1.049	3.98	0.866	0.085	0.9331
15. Define the characteristics of AC current and voltage.	4.29	0.845	3.89	0.935	1.717	0.0934
16. Calculate the effect of capacitance in an AC circuit.	4.05	0.921	3.69	1.019	1.425	0.1617
17. Verify the effect of capacitance in an AC circuit.	3.91	1.091	3.73	0.939	0.621	0.5390
18. Calculate the effect of inductance in an AC circuit.	4.00	0.949	3.73	0.939	1.067	0.2927
19. Verify the effect of inductance in an AC circuit.	3.86	1.153	3.80	0.991	0.196	0.8459
20. Calculate the impedance, phase angle, power and voltage in series circuits.	3.67	1.197	3.73	0.939	-0.225	0.8235
21. Measure the impedance, phase angle, power and voltage in series circuits.	3.47	1.209	3.71	0.991	-0.777	0.4428
22. Calculate the impedance, phase angle, power and current in a parallel circuit.	3.47	1.289	3.67	1.022	-0.595	0.5558
23. Measure the impedance, phase angle, power and current in parallel circuits.	3.38	1.284	3.60	1.031	-0.686	0.4979
24. Solve problems involving AC networks.	3.48	1.365	3.80	1.057	-0.961	0.3439

TABLE I CONTINUED

Competencies	EDUCATORS		EMPLOYEES		Value of t	Probability of t
	Mean	Standard Deviation	Mean	Standard Deviation		
25. Solve problems involving three phase systems.	2.71	1.231	3.84	1.043	-3.642 *	0.0009
<u>Principles of Electronic Circuits</u>						
26. Identify the characteristics of semi-conductors and properties of PN junctions.	4.29	1.007	3.55	0.990	2.758 *	0.0089
27. Breadboard, operate and troubleshoot the diode rectifier, diode limiter, and diode clamper.	3.71	1.231	3.60	1.156	0.358	0.7222
28. Evaluate device parameters of diodes and transistors.	3.81	1.167	3.40	1.095	1.354	0.1843
29. Construct, analyze and troubleshoot small-signal transistor amplifiers.	3.76	1.136	3.71	0.968	0.177	0.8605
30. Construct, analyze and troubleshoot power transistors.	3.62	1.322	3.56	1.099	0.191	0.8494
31. Apply thevenins theorem to analyze the transistor circuit in terms of current and voltage gain.	3.29	1.309	3.27	1.053	0.058	0.9538
32. Calculate and measure the input impedance and output impedance of a given transistor amplifier.	3.62	1.024	3.36	1.131	0.941	0.3518
33. Operate a transistor test and/or a curve tracer to obtain the electrical rating of a transistor.	3.29	1.056	3.44	0.943	-0.588	0.5602
34. Model a transistor circuit for AC and DC in order to obtain the transfer functions.	3.48	0.981	3.38	1.114	0.363	0.7181
35. Apply the load line technique and the operating point to classify the amplifier operation.	3.67	0.913	3.27	1.053	1.577	0.1219
<u>Principles of Industrial Electronics</u>						
36. Construct solid state controls.	3.19	1.123	3.49	1.058	-1.024	0.3126
37. Calculate and test phase shift control circuits.	3.05	1.244	3.58	1.076	-1.681	0.1019

TABLE I CONTINUED

Competencies	EDUCATORS		EMPLOYERS		Value of t	Probability of t
	Mean	Standard Deviation	Mean	Standard Deviation		
38. Set up and test a SCR with AC bias control.	3.14	1.315	3.64	1.171	-1.494	0.1442
39. Set up and test the response of photo-electric devices	2.95	1.396	3.60	1.176	-1.843	0.0743
40. Set up and test the photo-electric control of a SCR.	3.14	1.389	3.60	1.136	-1.317	0.1973
41. Test different types of relay circuits.	3.24	1.136	3.71	1.079	-0.601	0.1180
42. Test different types of timing circuits.	3.38	1.284	3.80	0.968	-1.330	0.1932
43. Set up and test delay relay circuits.	3.38	1.244	3.62	1.051	-0.770	0.4469
44. Use the UJT as a triggering device.	3.29	1.309	3.31	1.125	-0.077	0.9393
45. Graph curves of variables reluctance phase shift circuits.	2.38	1.071	3.24	1.131	-2.996 *	0.0046
46. Set up and test different motor control circuits.	2.95	1.244	3.51	1.160	-1.736	0.0912
47. Set up and test different servo systems.	3.05	1.322	3.44	1.139	-1.185	0.2441
<u>Principles of Microcomputer</u>						
48. Identify the functions and application of a digital computer.	3.95	1.203	3.93	1.074	0.062	0.9510
49. Apply the principles of boolean algebra to the digital circuit.	3.71	1.189	3.84	1.167	-0.417	0.6793
50. Connect, test and troubleshoot digital circuits.	3.90	1.179	4.09	0.974	-0.638	0.5281
51. Connect, test and troubleshoot computer control circuits.	3.62	1.117	3.96	1.127	-1.137	0.2626
52. Connect, test and troubleshoot computer memory circuits.	3.43	1.287	3.96	1.065	-1.633	0.119
53. Develop, load and run programs on a minicomputer.	3.14	1.315	3.73	1.136	-1.772	0.0853
54. Identify digital codes and mnemonic codes.	3.52	1.167	3.91	1.104	-1.277	0.2095

TABLE I CONTINUED

Competencies	EDUCATORS		EMPLOYEES		Value of t	Probability of t
	Mean	Standard Deviation	Mean	Standard Deviation		
55. Describe the architecture of micro-processor and microcomputer.	3.62	1.071	3.80	1.160	-0.622	0.5371
56. Interface microprocessor with I/O.	3.48	1.167	3.76	1.131	-0.915	0.3661
57. Write, debug and run microcomputer programs.	3.14	1.101	3.87	1.014	-2.701 *	0.0102
58. Use control buss for external controllers.	3.29	1.146	3.71	1.121	-1.414	0.1655
59. Use standard test equipment and procedures to check performance of a microprocessor.	3.48	1.209	3.64	1.209	-0.527	0.6018
60. Use test equipment to calibrate electrical circuits in a microprocessor.	3.33	1.278	3.96	1.167	-1.893	0.664
<u>Principles of Industrial Power</u>						
61. Test and performance of different types of DC motors.	3.00	1.183	3.67	1.066	-2.199 *	0.0346
62. Analyze the operation of AC generators.	3.33	1.317	3.56	0.943	-0.695	0.4927
63. Set up and verify the load characteristics of a polyphase motor.	3.14	1.389	3.49	1.180	-0.988	0.3305
64. Verify the losses and efficiency of a motor by different methods.	3.00	1.140	3.49	1.141	-1.622	0.1128
65. Set up and verify the operation characteristics of different types of synchros.	3.05	1.284	3.29	1.141	-0.736	0.4664
66. Verify the polarity and load performance of a transformer.	3.05	1.359	3.60	1.095	-1.631	0.1126
67. Verify the transformer losses and equivalent circuits.	3.48	1.250	3.11	1.283	1.096	0.2797
68. Calculate transformer efficiency and voltage regulation.	3.38	1.203	3.29	1.036	0.302	0.7643
69. Test the performance of different three phase connections.	3.23	1.300	3.31	1.145	-0.221	0.8267
70. Calculate the mechanical characteristics of a servo system	3.05	1.322	3.07	1.095	-0.057	0.9545

TABLE I CONTINUED

Competencies	EDUCATORS		EMPLOYERS		Value of t	Probability of t
	Mean	Standard Deviation	Mean	Standard Deviation		
<u>Principles of Advance Electronic Circuits</u>						
71. Identify the characteristics of the field-effect transistor and evaluate the device parameters using the device parameters.	3.71	1.146	3.20	1.217	1.664	0.1037
72. Construct, analyze and troubleshoot the field-effect transistor amplifier.	3.48	1.327	3.33	1.148	0.425	0.6738
73. Simplify circuit using decibels and Miller's theorem.	3.00	1.342	3.36	1.048	-1.071	0.2922
74. Calculate and test frequency effect on amplifiers.	3.86	1.236	3.47	1.079	1.243	0.2223
75. Construct, analyze and troubleshoot the differential amplifier circuit.	3.57	1.207	3.49	1.058	0.269	0.7897
76. Construct, analyze and troubleshoot operational amplifier circuits.	3.62	1.359	3.49	1.100	0.384	0.7035
77. Apply the principles of feedback to amplifiers.	3.67	1.111	3.38	1.154	0.972	0.3368
78. Apply the principles of feedback to oscillators.	3.86	1.195	3.40	1.116	1.478	0.1482
79. Analyze the amplifier distortion with the distortion analyzer or spectrum analyzer.	3.24	1.221	3.31	1.164	-0.230	0.8196
80. Locate the harmonics present to a mixer.	3.43	1.165	3.13	1.079	0.981	0.3329
81. Construct, analyze and troubleshoot voltage regulators.	3.38	1.396	3.42	1.055	-0.120	0.9049
<u>Principles of Electronic Drafting</u>						
82. Identify standards electronic symbols on diagrams.	3.48	1.537	3.51	1.272	-0.091	0.9183
83. Prepare electronic schematics	3.52	1.209	3.44	1.253	0.245	0.8073
84. Prepare all drawings necessary for plan and manufacture of printed circuit boards.	3.24	1.411	3.24	1.351	-0.017	0.9863

TABLE I CONTINUED

Competencies	<u>EDUCATORS</u>		<u>EMPLOYERS</u>		Value of t	Probability of t
	Mean	Standard Deviation	Mean	Standard Deviation		
85. Use drafting equipment and procedures to represent electronic data.	3.43	1.276	3.31	1.287	0.346	0.7311
86. Prepare block diagrams for electronic and computer systems.	3.38	1.159	3.44	1.284	-0.193	0.8481
87. Use standard abbreviations, component references, military and engineering standards.	3.48	1.176	3.27	1.327	0.619	0.5400
<u>Principles of Radio Communication</u>						
88. Apply FCC rules and regulations to radio communication.	3.43	1.258	2.91	1.568	1.326	0.1941
89. Align IF amplifiers and RF power amplifiers.	3.43	1.234	2.98	1.363	1.289	0.2058
90. Connect, evaluate and troubleshoot amplifiers amplitude and frequency modulators.	3.29	1.177	3.02	1.231	0.821	0.4167
91. Connect, evaluate and troubleshoot Foster-Seeley discriminators, ratio detector, and quadrature modulators.	3.33	1.261	3.04	1.155	0.919	0.3633
92. Connect and align RF amplifier tuners	3.43	1.261	3.00	1.248	1.295	0.2029
93. Connect, evaluate and troubleshoot the balance modulator.	3.24	1.198	3.13	1.179	0.334	0.7399
94. Identify the principles of telemetry and multiplexer in the industrial control circuits.	3.05	1.284	3.18	1.322	-0.376	0.7091
95. Operate and align a transmitter.	3.43	1.242	3.16	1.248	0.829	0.4123
<u>Principles of Electronic Projects</u>						
96. Connect, evaluate and troubleshoot linear integrated circuits.	3.57	1.215	3.42	1.076	0.503	0.6174
97. Identify integrated circuit logic memories.	3.76	1.100	3.49	1.179	0.895	0.3769

TABLE I CONTINUED

Competencies	EDUCATORS		EMPLOYERS		Value of t	Probability of t
	Mean	Standard Deviation	Mean	Standard Deviation		
98. Connect, evaluate and troubleshoot digital integrated circuit sub-systems.	3.43	1.272	3.51	1.076	-0.273	0.7857
99. Use the guidelines of technical writing to write project reports.	3.33	1.197	3.56	1.364	0.069	0.9453
100. Using the transistor logic, CMOS logic or emitter coupled logic to implement a logic function.	3.67	1.017	3.56	1.324	0.374	0.7098
101. Troubleshoot digital circuits using an oscilloscope and/or logic state analyzer (Data domain scope).	3.76	1.179	3.69	1.276	0.228	0.8206
102. Connect and troubleshoot photodetectors and source detectors such as photoconductors, photodiodes, solar cells.	3.57	1.028	3.80	1.272	0.778	0.4404
103. Connect and test A/D and D/A convertors.	3.61	1.024	3.33	1.087	1.035	0.2094
104. Connect and test phase loop circuits.	3.48	1.078	3.11	1.092	1.276	0.2094

* Significant at the .05 level

CONCLUSIONS

Certain conclusions were drawn concerning differences in perceptions of electronic technology teachers and employers of electronic technology graduates regarding competencies needed. ITET programs were believed not to be placing emphasis, to the degree desired by employers of electronics, on many competencies. In a few instances, electronic teachers placed more emphasis on competencies than employers of electronics thought was necessary.

It appears that educators place more emphasis on topics which lend themselves to classroom instruction, and tend to place less emphasis on operations involved in complex circuit operation. Specially, educators appeared to place more emphasis on terms such as calculate, describe, solve, and verify, and placed less emphasis on terms such as construct, connect, set up and test.

It appears that employers place more emphasis on skills, knowledge and attitudes relevant to work with complex electronic circuits. Specially, employers placed more emphasis on terms such as construct, connect, set up and test, and placed less emphasis on terms such as calculate, describe, solve and verify.

In the Principles of Direct Current Course, there was close agreement in perception between educators and employers regarding the importance of competencies needed to training ITET's for industry. Significant differences in perception between educators and employers were found on one competency (statement 2), define electrical

quantities such as potential, current, resistance, power and energy.

In the Principles of Alternating Current Course, significant differences in perception between educators and employers were found on one competency (statement 25), solve problems involving three phase systems. There is close agreement in preception between educators and employers regarding importance of 11 competencies included in the Principles of Alternating Current Course.

In the Principles of Electronics Course, educators perceived none of the 10 competency statements to be important or more important than average to training electronic technologists for industry. Educators perceived one of the 10 competency statements to be less important than employers. Significant differences in perception between educators and employers were found on one competency (statement 26), identify the characteristics of semi-conductors and properties of PN junctions.

In the Principles of Industrial Electronics Course, employers perceived all 12 competency statements to be important or more important than average to training ITET's for industry. Educators perceived all 12 competency statments to be less important than employers thought was necessary to training electronic technologists for industry. Significant differences in perception between educators and employers were found on one competency (statement 45), graph curves or variable reluctance phase circuits.

In the Microcomputer Course, employers perceived 12 of the 13 competencies to be more important than educators perceived important to training electronic technologists for industry. Significant differences in perception between educators and employers were found on one competency (statement 57), write, debug and run microcomputer programs.

In the Industrial Power Course, employers perceived eight competencies to be important or more important than average to training electronic technologists for industry. Educators perceived two competencies to be important or more important than average in training electronic technologists for industry. Significant differences in perception between educators and employers were found on one competency (statement 61), test and performance of different types of DC motors.

Of the 11 competencies listed in the Advanced Electronic Circuits Course, there were no significant differences in perception between educators and employers found regarding the importance of competencies needed to training electronic technologists for industry. Educators placed more emphasis on eight competencies than employers thought was necessary. Educators placed less emphasis on two competencies than employers thought was necessary.

The Electronic Drafting Course contained competencies thought to be essential by employers. There was no significant difference in perception among the mean values of educators and employers

to the importance of competencies needed to training electronic technologists for industry.

In the Radio Communication Course, educators perceived seven of the eight competencies to be more important than the perception of employers. No significant differences in perception between educators and employers of competencies needed to training electronic technologists were found to exist in the Radio Communication Course.

In the Electronic Projects Course, there was close agreement between educators and employers of the nine competencies included. There was no significant difference in perception between educators and employers of the importance of competencies needed to training electronic technologists for industry.

The results of this study indicate that educators and employers are in close agreement on the competencies needed to train electronic technologists for industry. From the data collected, the following general conclusions may be drawn:

1. In general, four-year programs of electronic technology seem to provide prospective employees good background.
2. Differences in perception between teachers and employers regarding importance of competencies needed by electronic technology graduates were smaller than literature and prevalent opinion lead one to expect.
3. Educators placed more emphasis on topics which lend themselves to classroom instruction.

4. Employers place more emphasis on skills, attitude and knowledge required to work with complex electronic circuits.

It is hoped the data base produced by this study will provide a reference for research to determine significant differences in perception between electronic educators and electronic employers regarding the competencies needed by electronic technology graduates. Research is needed in this area because electronics is changing at such a rapid rate that it is difficult for four-year technology programs to keep pace with technological advances.

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